GREATER HARTFORD MOBILITY STUDY

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EXISTING CONDITIONS REPORT - EXECUTIVE SUMMARY

CONNECTICUT DEPARTMENT OF TRANSPORTATION
DECEMBER 20 2021

Greater Hartford Mobility Study

Existing Conditions Report

Executive Summary

December 20, 2021

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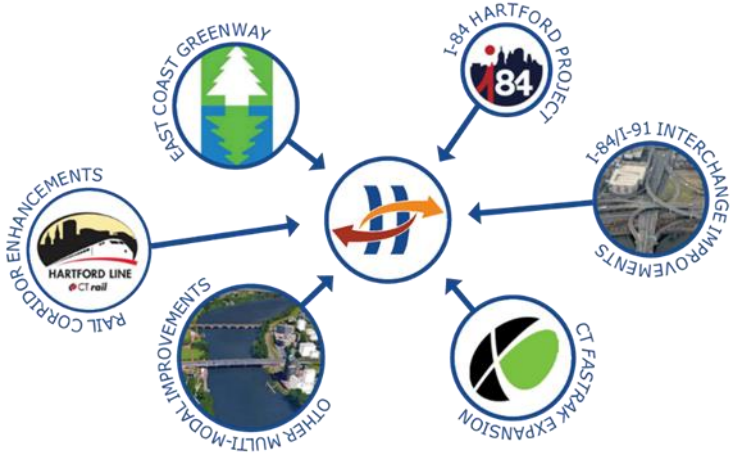
Executive Summary

The Connecticut Department of Transportation (CTDOT) is taking a holistic approach to improve mobility for all modes of travel within the Greater Hartford area. The Greater Hartford Mobility Study (GHMS) will assess multimodal transportation deficiencies impacting mobility in the region and provide a mechanism to identify, assess and prioritize a variety of short-, mid- and long-term improvement projects for further study and/or implementation. The purpose of this report is to highlight key existing conditions related to each mode that will establish needs for specific system improvements to achieve the vision and goals that GHMS has established for the Greater Hartford region.

Study Overview and Introduction

GHMS is a *Planning and Environmental Linkage (PEL)* study that will facilitate simultaneous consideration of planning vision, economic goals, community goals and environmental goals by an early and ongoing coordination with the public, local stakeholders, and appropriate resource agencies. With multiple transportation initiatives currently in various phases of analysis and/or implementation in the Greater Hartford region, the GHMS PEL will provide a holistic approach to assess these initiatives and other potential multimodal mobility improvement opportunities with an integrated and overarching regional planning study.



PEL represents a collaborative and integrated approach to transportation decision-making that considers benefits and impacts of proposed transportation system improvements to the environment, community, and economy during the transportation planning process.
-FHWA

The area included in this PEL study is shown in **Figure 1**.

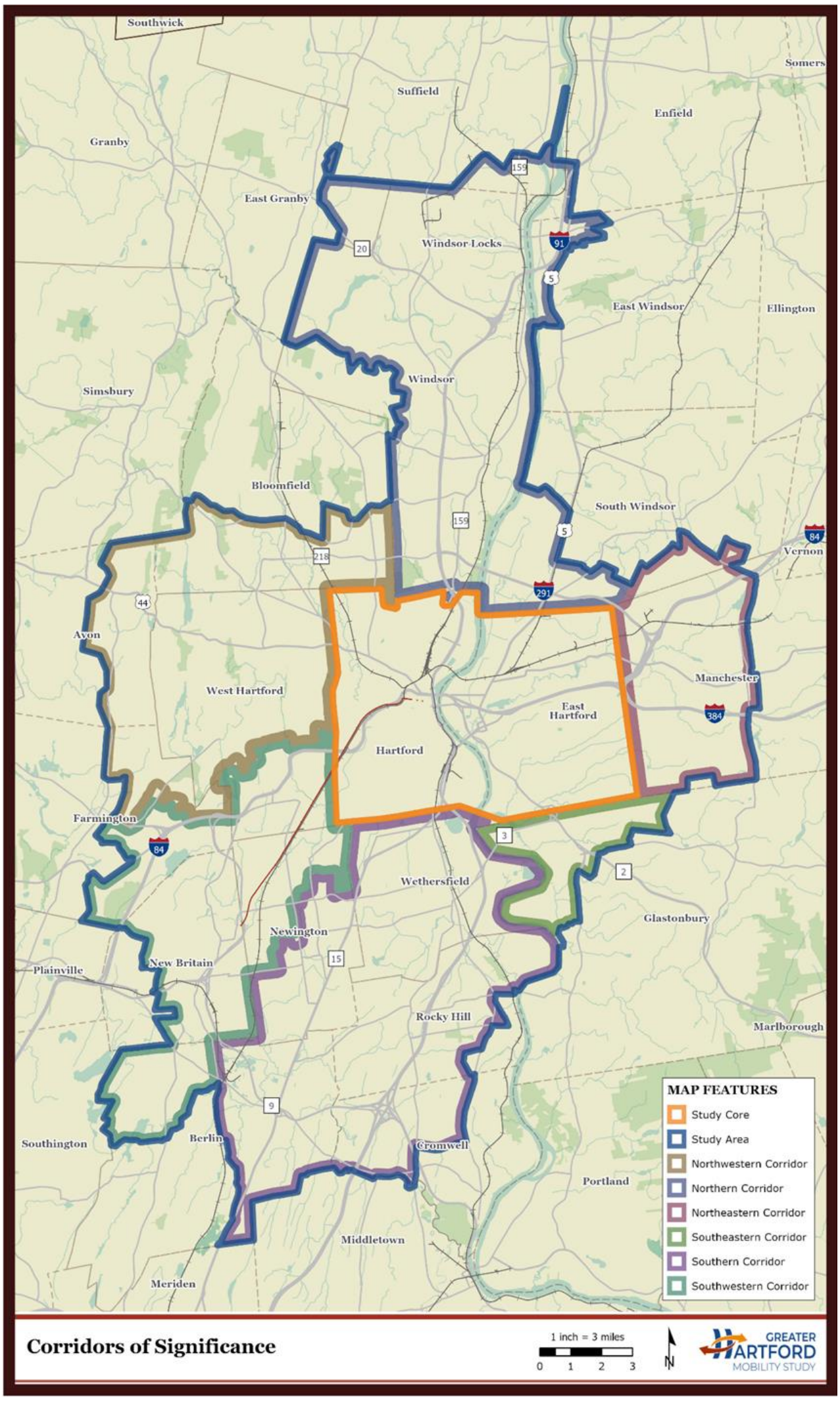


Figure 1: GHMS Study Area Corridors of Significance

For analysis purposes, the study area was divided into seven (7) Corridors of Significance (COS) as shown in the above figure. The COS form a primary multimodal transportation network that serve a vast number of people who move about the region. These corridors influence where people choose to live and work, where new development happens, the travel options that are available, and how the environment is impacted. The existing conditions performance assessment of the study area was conducted by the following modes and/or focus areas:

1. Traffic
2. Highway and safety
3. Bus
4. Rail
5. Environmental resources and conditions
6. Land use
7. Multimodal connectivity

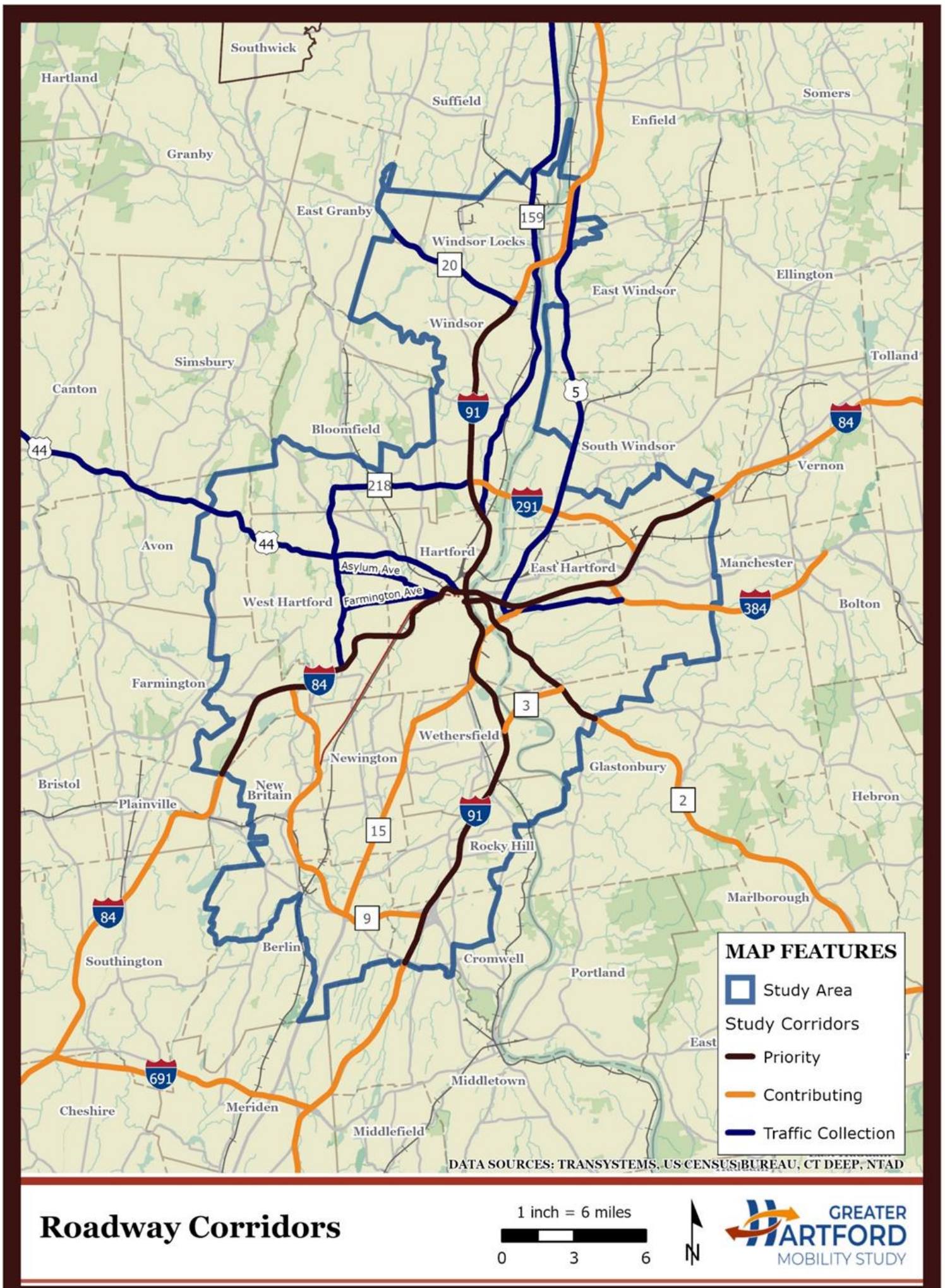


Figure 2: Roadway Corridors

Analysis Approach and COVID-19 Impacts

The COVID-19 pandemic significantly impacted transportation services, travel patterns and choices throughout 2020. While the transportation services and travel patterns are on the road to recovery in 2021, it is still too early to determine whether the transportation industry will be back to the pre-pandemic levels or to a "new normal" with new travel patterns and choices. It is also unclear how quickly this full or partial recovery will happen.

Assuming that travel patterns and associated mobility considerations will be back to the pre-pandemic conditions, the GHMS team focused on pre-pandemic transportation data (mostly from 2019) to conduct multimodal existing conditions analysis. However, the team also recognizes significant and real potential for variations with travel behavior, travel choices, technological changes and policy implications that may impact transportation system performance and may alter transportation system improvement needs in upcoming years. As such, the team will be utilizing a Greater Hartford region-specific scenario planning tool for conducting future condition analysis.

As such, unless otherwise noted, the data used for conducting the existing conditions analysis is prior to COVID-19. At the time of publication, traffic volumes nationwide have mostly recovered to exceed pre-pandemic levels, but there are still lasting changes in the way people work and live. For example, the morning peak period has become less prominent, and mass transit ridership is still substantially below pre-pandemic levels.

Existing Conditions Traffic Analysis

Types of Analysis

The existing conditions assessment analyzed traffic volumes, speeds, and travel patterns based on data collected prior to COVID-19. It also listed some of the potential long-term impacts of COVID-19 on traffic patterns that are being considered. Data was collected from traffic count stations throughout the study area, as well as the National Performance Management Research Data Set (NPMRDS)[1] and StreetLight Data[2] Platform. The collected data allowed congestion to be characterized by route, direction, and time of day and to determine hotspots for recurring congestion within the GHMS study area. The overall cost of congestion was also estimated for each route.

[1] The NPMRDS offers a free data source to State and Local transportation agencies for monitoring and reporting transportation system performance measures, as well as for setting and meeting mobility objectives and targets. The NPMRDS contains field-observed travel time and speed data collected anonymously from a fleet of probe vehicles (cars and trucks) equipped with mobile devices. Using time and location information from probe vehicles, the NPMRDS generates speed and travel time data.

[2] StreetLight Data is an on-demand mobility analytics platform. It takes big data from mobile devices to fuel analyses like travel origin and destination matrices, travel time and select link studies.

Key Findings

1. In the morning peak, traffic predominantly flows towards Hartford, and then leaves the city in the evening peak. This trend is responsible for much of the traffic congestion on major routes within the study area. However, some routes, such as I-84, experience congestion outside of peak hours as well.

2. Nearly 3 out of every 4 trips destined for the Study Core (Hartford and East Hartford) originate within the Study Core. While predominant trips are shorter-distanced localized trips with both of the trip ends within the Study Core, a significant portion of these trips rely on the Primary Corridors to access their destinations. This offers an opportunity for strategic improvements focused on bike, pedestrian and transit infrastructure within the Study Core to encourage meaningful mode shift and reduced congestion on key Study Core corridors.

3. Of the corridors analyzed, I-84 and I-91 within the study area have the most congestion. Excluding the HOV lanes, annual congestion costs on I-84 are $86 million, and annual congestion costs on I-91 are $102 million.

4. While congestion is a function of volume to capacity (v/c) ratio, other factors such as geometric deficiencies, lane continuity and lane balance also contribute to the recurring congestion. The I-91 and I-84 interchange in the study core is a major congestion hotspot due to capacity, lane continuity, lane balance issues and contributes to significant congestion in the Study Core. Other congestion hotspots are the I-91 / Route 15 interchange and the I-91 / I-691 interchange. Traffic signals along non-freeway study corridors also contribute to congestion.

- *Congestion correlates with the predominant commuting direction.*
- *Nearly 3 out of every 4 trips destined for the Study Core originate within the Study Core.*
- *The annual cost of congestion for the Primary Corridors (I-84, I-91, Route 2) is nearly $200 million.*

5. While circumferential routes such as I-291, I-691, and Route 9 allow through traffic to bypass some congestion, there is no full bypass around the study core, and these alternative routes themselves are congested.

6. The movement of freight is disrupted due to unpredictable travel times. Non-recurring congestion has a disproportionate impact on freight.

7. Travel pattern assessment showed most trips are short-distanced and localized, resulting in the necessity to identify specific needs for each corridor of significance.

8. During the AM Peak Period, the largest travel Origin-Destination (OD) pairs (excluding localized trips within each corridor of significance) are from the South, the Southwest, and the Northwest to the Study Core. The same OD pairs show largest reverse trip pattern during the PM Peak Period.

9. The pattern of trip destinations from the Northeast and Southeast tend to be more dispersed than the other corridors of significance with a higher concentration of trip destinations in East Hartford in the Study Core.

Table 1: Traffic SWOT Analysis

Strengths

- Large stretches of I-84 east of Manchester and I-91 north of Windsor operate at or near the speed limits and densities throughout the day.
- I-384 operates well with minimal congestion throughout the day.
- I-691, Route 9, Route 72, CT*fastrak*, and the Hartford Line provide multiple travel options southwest of Hartford.
- Several elements of transportation demand management are in place, such as ridesharing, paid parking, transit incentives, and high-occupancy vehicle lanes.

Weaknesses

- The overall transportation network around Hartford has little redundancy, with limited crossings of the Connecticut River and Metacomet Ridge acting as chokepoints.
- There are few options for through traffic to bypass the more congested core.
- Traffic volumes exceed capacity on certain segments of I-84 and I-91, as well as at several interchanges, resulting in recurring congestion and hundreds of millions of dollars in annual delay costs to motorists.

Opportunities

- The HOV lanes north and east of Hartford are well below capacity and could support additional traffic.
- The long-term effects of COVID-19 may result in increased telework and reduced congestion in the morning peak.
- Transportation demand management could be expanded to further reduce peak congestion.

Threats

- Suburban development around Hartford has led to longer commutes and automobile reliance.
- Traffic signals on high-volume surface streets such as U.S. Route 44 and Route 218 produce disproportionately large amounts of air pollution and delay.
- Congestion results in elevated crash rates, especially on I-84 and I-91.
- Most trips are made in gas-fueled vehicles, contributing to CO_2 emissions.

Highway and Safety Analysis

Types of Analysis

The Primary Corridors (I-84, I-91 and Route 2) were analyzed for consistency with roadway and interchange design criteria found in CTDOT's "Highway Design Manual" and AASHTO's "A Policy on Geometric Design of Highways and Streets". The analysis included a review of roadway geometrics vs. posted speed limit, horizontal sight distance restrictions and interchange spacing. These highway design elements can have a significant impact on travel speeds and mobility within the study area.

Key Findings

1. Although there were several locations with stopping sight distance deficiencies, the impact to mobility is likely minimal except in locations where frequent crashes occur.

2. The section of I-84 between Interchange 41 (South Main Street) and the Bulkeley Bridge has extremely complex geometry, including several compound curves, 'broken-back' curves, and reverse curves with short tangents. The interchange frequency and inconsistent configurations make this section of I-84 the most challenging stretch of highway within the study area for motorists to traverse. Combining these two deficiencies with the highest vehicular volumes in the State leads to higher-than-average crash rates and recurring vehicular delay.

3. The horizontal curve on I-91 southbound just north of the Charter Oak Bridge has a sharp radius that does not meet minimum standards for the posted speed limit. This substandard horizontal geometry is likely the cause of higher-than-average crash rates and should be studied for potential solutions.

4. High crash rates in the region are typically associated with traffic signals, congestion, left-hand ramps, weaving, lane reductions, closely spaced interchanges, and geometric deficiencies.

5. All of the original bridges along the priority corridors are 50 to 60 years old and have outlived their original design life of 50 years. Many of these structures have been rehabilitated more than once and will require additional rehabilitation to maintain a state of good repair, as defined by a condition rating of 5 (fair) or better.

6. For the bridges studied in the priority corridors 26% have an overall condition rating of 5 (fair), 48% have a rating of 6 (satisfactory) and 23% have a rating of 7 (good). The higher-rated bridges are generally the structures that were replaced during recent highway modification projects.

7. 37% of priority corridor bridges are noted as functionally obsolete, indicating they do not comply with the latest geometric and safety standards.

Table 2: Highway AND Safety SWOT Analysis

Strengths

- Highway alignments north, south, and east of Hartford meet or exceed geometric standards for the posted speed limit.
- System interchanges outside of Hartford are generally built to modern standards and permit high-speed movements between freeways.
- Freeway crash rates through much of the region are relatively low.

Weaknesses

- The I-84 corridor west of Hartford is extremely complex and carries heavy traffic volumes. Morning and evening peak periods exhibit significant delays – both recurring and non-recurring.
- Large portions of I-84 and Route 2 were designed and constructed before modern highway design standards were developed.
- Route 2 has several closely spaced interchanges in East Hartford. This close ramp spacing has deleterious effects on traffic flow and safety.
- The freeway network is tightly interwoven with railroad tracks and Hartford's flood control system.
- Many bridges were built over 50 years ago and are functionally obsolete.

Opportunities

- Highways north, south and east of Hartford appear to have ample rights-of-way and could possibly support multi-modal expansion.
- Several large interchanges on I-84 could be reconstructed within a smaller footprint, freeing up land and improving highway design and safety.

Threats

- I-84, I-91, and Route 2 have elevated crash rates within Hartford and East Hartford.
- The elevated portions of I-84 in Hartford require increased investments to maintain in a state of good repair.
- The freeway network around Hartford has limited redundancy.

Transit Bus Analysis

Types of Analysis

The existing conditions bus analysis used two data sources: CT*transit* operational data, representing actual routes and service frequency, and the regional travel demand model, providing insight into demographics and travel patterns. The analysis focused on bus travel times, transit travel time competitiveness compared to use of personal vehicle, mode share, frequency and span of service, on-time performance and reliability, safety, and the average age of vehicles in the fleet.

Key Findings

1. A Transit Dependency Index (TDI) was calculated based on four factors that indicate a high level of need for public transit services: population below poverty line, zero car households, senior population and population under 18 years of age. It showed Southern, Western and Northern Hartford with the top three TDI values followed by Central New Britain, Central Manchester and East Hartford.

2. Approximately 150,000 jobs in the region, most of which are in the City of Hartford, are within a 20-minute transit trip of the six TDI area of high transit need.

3. Downtown Hartford is well connected by the existing bus network. However, suburban employment areas are not as well connected, limiting access to these jobs by people without cars. With most jobs located in downtown Hartford and four of the six residential areas of high transit need clustered around it, CT*transit*'s current fixed route network serves the needs of downtown commuters and central city residents well. Alternatives may be needed to better serve suburban employment hubs and areas of high transit need.

4. The central part of the region, and particularly the City of Hartford and the CT*fastrak* corridor, are well served by frequent, long service span routes. More suburban areas are still well covered by fixed-route transit but at lower frequencies and spans of service that make accessing jobs there more challenging.

5. All of the routes with 1,000+ average boardings per day are either Local or CTfastrak routes, most of which have headways of 20 minutes or less during the AM/PM periods and 30 minutes or less during the midday period along with service spans over 18 hours per day.

6. On-time performance varies greatly between routes with some of the busiest routes having the lowest reliability. Average on-time performance for all routes was 67.6%. In other words, every two out of three buses operating on study area fixed transit routes operate on-time on average.

7. Overall, the majority of CT*transit*'s Hartford / CT*fastrak* fleet is below retirement age and in line with the average fleet age of peer agencies.

Table 3: Bus SWOT Analysis

Strengths	Weaknesses
• CT*fastrak* ridership has grown with route 101 now by far the busiest route in Hartford's transit system. • CT*fastrak* is gaining acceptance as a contributor to successful Transit Oriented Development (TOD). • Base network metrics - safety, efficiency, fleet age - are solid.	• Like local bus service in many places, service is slower than ideal, limiting ridership growth. • Reliability of local routes, especially heavier traveled routes, could be better. • Evening service is often infrequent.
Opportunities	**Threats**
• CRCOG is completing a study of transit priority on the five main local transit corridors in the Hartford region, which could change the dynamics of slow and/or unreliable service. • Economic growth and TOD is associated with an enhanced regional bus network. • Growing importance of equity in transportation can be met by improved bus services.	• The bus system, especially express routes, is threatened by uncertainties associated with the COVID-19 pandemic. • Changes in type and level of ridership due to altered commuting patterns related to COVID-19. • Low density development patterns continue to expand and are difficult to serve.

Rail Service Analysis

Types of Analysis

The GHMS study area is served by the CTrail-operated Hartford Line and intercity service operated by Amtrak. The existing conditions work assessed the type and level of service, condition of infrastructure and recent work, role of Hartford Union Station and its multimodal connectivity, including rail connectivity to Bradley Airport, and existing transit-oriented development (TOD) efforts.

Key Findings

1. Pre-pandemic, the Hartford Line had significant and growing ridership. Since the Hartford Line began operation in June of 2018, the line has experienced significant and growing ridership that has out-paced performance targets initially set by CTDOT.

2. Limited and aging equipment hinders system performance. The existing Hartford Line rolling stock consists of diesel locomotives and leased coaches (in conjunction with Amtrak equipment on their trips). Current proposals are looking at the use of dual-mode units which would allow more seamless operation between the Hartford and New Haven Lines and future potential through service into Grand Central Terminal.

3. COVID-19 / work-from-home-related ridership loss is a significant unknown and will make it difficult to forecast and adequately plan for the future. While initial modeling indicates a recovery back to pre-COVID-19 ridership levels in a 4-5-year time horizon, the data behind the projections is too limited and the recovery situation evolving too rapidly to make any concrete projections.

4. Regional rail investments and federal infrastructure investments create a vision for a more integrated and efficient regional rail network. There is an intensification of interest in regional rail improvements over the last several years which are now being bolstered by potential significant federal investment. These plans and talks of funding create momentum for rail initiatives in the greater Hartford region.

5. TOD opportunities and stronger regional integration are possible and will create broad economic benefits. This can be exampled through robust efforts in Meriden, ongoing construction in Berlin, and development around the station in Windsor. Realizing a complete regional rail vision will create the opportunity for dense TOD housing and the development of new employment opportunities. The corridor has historically lagged behind the Northeast Corridor in terms of economic growth. Achieving a complete rail vision will allow the region to catch up.

6. Old infrastructure on parts of the Hartford Line inhibits freight movement. The modern freight rail standard is not met on the Hartford Line due to

deficient bridges and culverts. This limits the line's integration with the regional and national freight networks and associated economic benefits.

Table 4: Rail SWOT Analysis

Strengths	Weaknesses
• Significant and growing ridership pre-COVID-19, with single highest monthly ridership posted in January 2020. • Alignment exists along the Knowledge Corridor where there are significant residential populations and jobs, with further opportunities for TOD and job growth in part catalyzed by rail opportunities.	• Limited and aging equipment hinder system performance. • Incomplete track and infrastructure work limits service density and freight movement. • No on-road bicycle amenities in downtown Hartford hurts last mile connections.
Opportunities	**Threats**
• Economic growth and TOD associated with an enhanced regional rail network. • Create an inland alternative to the Northeast Corridor to improve the resiliency of the corridor as it relates to climate change and state of good repair. • Renewed infrastructure focus with potential funding and expanded regional rail visions for greater system continuity and state of good repair.	• The rail system planning efforts are threatened by uncertainties associated with the COVID-19 pandemic. • Changes in type and level of ridership due to altered commuting patterns.

Bicycle and Pedestrian Analysis

Types of Analysis

The existing conditions assessment focused on identifying bicycle and pedestrian trip generators and attractors within a five-town focus area of the larger project area. That focus area includes the Towns of West Hartford, Windsor, East Hartford, and Wethersfield in addition to the City of Hartford. The goal of this task was to identify areas that exhibit the greatest demand or potential for generating bicycle and pedestrian trips based upon existing land uses.

Each type of land use was assigned a weight (expected level of bicycle and pedestrian trip generation or attraction) and a geographic influence (distance from the land use that trips are likely to occur to and from). A "heat map" of land use-based bicycle and pedestrian demand / potential was generated based upon those factors.

First- and last-mile connectivity (connections between transit stops and trip origins and destinations), was assessed by comparing transit station locations (CT*fastrak* and Hartford Line) and CT*transit* bus stops to sidewalk and bicycle facility infrastructure. Bicycle facilities are lacking in most areas served by transit stations and stops. The sidewalk network is good in proximity to transit stations but is less consistent in outlying areas of Windsor, West Hartford, Wethersfield, and East Hartford.

The data inputs used in the bicycle and pedestrian assessment were facility-based. The location and concentration of facilities that attract or generate bicycle and pedestrian trips was used as a proxy for areas of bicycle and pedestrian infrastructure demand. Areas with high concentrations of such facilities (such as schools, commercial centers, high density housing, major institutions, transit stations, etc.) were assessed as having more demand for bicycle and pedestrian trips and accommodations. User data, such as pedestrian and bicycle trip counts, was not used to establish facility demand. As such, this analysis is not subject to data irregularities associated with the COVID-19 pandemic.

Key Findings

1. Downtown Hartford has the highest level of bicycle and pedestrian generation and attraction (demand) within the study area.

2. The highest levels of demand in the five-town focus area are located in Hartford and are largely aligned with major corridors such as Albany Avenue, Farmington Avenue, and Franklin Avenue.

3. Areas of demand were also found through much of West Hartford and East Hartford and limited areas of Windsor and Wethersfield. Areas of higher demand in the towns surrounding Hartford are largely correlated with Town and commercial centers, schools, and major institutions.

4. Areas of high demand are generally well served by pedestrian facilities such as sidewalks although major barriers, primarily associated with I-84, I-91 and active and inactive rail corridors provide obstructions to bicycle and pedestrian connectivity. Bicycle facilities are lacking in many of the highest demand areas and along corridors in high demand areas such as Main Street, Albany Avenue, segments of Farmington Avenue, and Franklin Avenue in Hartford.

5. Sidewalks are most highly concentrated in the areas of the most intense demand as established by the calculated demand level. The relative quantity of available bicycle facilities, whether bike lanes or pathways did not correspond with the highest area of demand. The highest demand level (41+) is concentrated over Downtown Hartford where there are no designated bike lanes or established pathways designated for bicycle use. The East Coast Greenway route traverses this area but there are no established facilities dedicated for bicycle use along the route. The second highest demand level (31-40), which covers much of central Hartford, is also underrepresented by bicycle lanes in comparison to areas within other tiers of demand.

6. Local greenways and pathways hold potential to provide regional connections between high demand areas such as Downtown Hartford and medium or lower demand areas in surrounding towns. These facilities are also lacking in Downtown Hartford.

Table 5: Bicycle and Pedestrian SWOT Analysis

Strengths	Weaknesses
• Extensive and highly continuous sidewalk network in proximity of the I-84/I-91 interchange. • Multimodal transit network and service centered in proximity to the I-84/I-91 interchange that provides services to all communities within study area.	• Limited bicycle infrastructure throughout study area with few facilities in proximity to I-84/I-91 interchange. • Gaps in sidewalk network or lack of sidewalk network along bus transit routes in outlying areas of study area.
Opportunities	**Threats**
• Expand bicycle infrastructure, on-street and shared use pathway, to provide regional connectivity. • Expand bicycle infrastructure in proximity of I-84/I-91 interchange. • Build out sidewalk network along bus transit routes where network is lacking.	• Reduction, elimination, or lack of construction of bicycle and pedestrian facilities in favor of expansion of motor vehicle facilities or due to lack of funds for construction and maintenance. • Decrease to transit service levels (routes, frequency, and/or schedule).

Preliminary Environmental Analysis

Types of Analysis

Existing environmental considerations acknowledge the presence of natural resources, man-made resources and socioeconomic conditions within the study area. Natural resources are primarily associated with the Connecticut River and its tributaries. Regulatory protections are afforded to the river itself as a surface water body, to adjacent floodplain areas, and to its contributions to groundwater resources and wildlife habitat. These resources provide important natural functions but also act as a constraint to project development: impacts should be avoided or minimized as mobility solutions are developed. Open space and natural conservation / recreation areas are another notable natural resource, providing habitat diversity, resource recharge and opportunities for outdoor recreation.

Key Findings

1. Man-made resources emanate from the densely developed study area core to adjacent urban and suburban communities. In addition to the major employment and commercial centers that dominate the built environment, the study core contains hundreds of historic properties and numerous historic districts with their own regulatory protections.
2. Also acknowledged as man-made conditions are hundreds of hazardous waste sites: while the vast majority represent minor spills that have been remediated, larger areas, particularly along the CT*rail* / Hartford Line corridors, will require further investigation as rail-related solutions are considered.
3. Socioeconomic conditions within the study area include a high prevalence of Environmental Justice communities within the study core and southwest sector. These areas exhibit a higher-than-average percentage of low-income or minority residents, residents with limited English proficiency, or combinations of any of those three characteristics. In addition, these areas also represent the highest prevalence of zero-vehicle households and, by extension, transit dependency. Mobility solutions that promote equity, improve connections to employment centers, health care and educational facilities, and improve pedestrian and bicycle facilities will provide noticeable benefits to these areas.

Table 6: Environmental SWOT Analysis

Strengths	Weaknesses
• High density of employment centers, population and commercial activity. • Prevalence of hospitals, health care and educational institutions. • Transit-Oriented Development (TOD) zoning in place in several communities (including Hartford).	• Prevalence of zero-vehicle households and transit-dependent populations. • Regulatory constraints associated with natural resources, historic resources and contaminated properties.
Opportunities	**Threats**
• Invest in mobility solutions that reflect the needs of Environmental Justice communities. • Provide mobility solutions that improve /increase access to jobs, health care and basic services.	• Displacement of Environmental Justice communities due to increased development. • Increased risk to public health (air quality, noise impacts) without multimodal and active transportation improvements. • Inequity in siting of transportation facilities.

Land Use Analysis

Types of Analysis

The land use existing conditions assessment placed special emphasis on those portions of the study area where current land use and desired or expected land use change will play an especially important role in economic development and quality of life for the Greater Hartford region.

The location, type, and intensity of various land uses – particularly those serving employment, residence, shopping and services, education, and leisure – are intrinsically connected to structure and performance of the multi-modal transportation network. Greater mix and intensity of land use can reduce travel need and trip distance in the first place. Presence of multiple convenient transportation mode options in developed areas can serve the region's population, businesses, and institutions more inclusively by accommodating the unique travel needs and preferences of different people. It also makes economic activity and the overall transportation system more resilient in face of disruptions.

Key Findings

1. Real estate and business development should be focused in a relatively limited number of walkable focus areas within the GHMS area to maximize economic and community development.
2. Real estate and business development will not inevitably flow to the designated focus areas, even though many have appropriate zoning and land use priorities in place. While some focus areas have recently gained benefit of improved transit services and other assets thanks to proactive regional effort, most areas will require additional proactive efforts to attract market-driven development.
3. National-scale changes in land use, such as potential reduced office and retail space demand, are already forcing a rethinking of land uses in certain areas. This can present important new opportunities in some focus areas but may require updated approaches to multi-modal transportation, zoning, or other supportive elements, entailing additional study and resources.

Table 7: Land Use SWOT Analysis

Strengths

- Anchor employers and higher education institutions attract significant numbers of new residents and young professionals to the region annually.
- Significant cultural and recreational amenities.
- Low unemployment, relatively high median income.
- Strong foundation of strategic regional economic development planning involving multiple municipalities, private sector leadership.
- Long-established urban development and infrastructure patterns provide economic, social, and physical resilience.
- Less vulnerable to climate change than coastal peer communities.

Weaknesses

- Stagnant population growth, as many residents are lost each year to other places offering competitive quality of life.
- Lack of population growth limits economic growth due to constrained workforce.
- Residential areas have inequitable access to jobs, amenities, transportation options.
- Dispersed job and housing concentrations require significant commutes and are hard to connect via transit corridors.
- Many priority locations for compact, transit-oriented development have development challenges such as brownfields cost premiums, disinterested ownership, placemaking / repositioning needs, infrastructure needs.
- Different municipalities may have economic development motivations that differ from land use approaches that would support the region best as whole

Opportunities

- Leverage recent transit investments to attract & retain target workforce, real estate & business development.
- Leverage established walkable mixed-use urban areas to expand resident access to economic opportunity, quality of life amenities.
- Limit future infrastructure costs by concentrating development in compact areas around existing infrastructure.

Threats

- Competing cities and regions may continue to draw prime workforce out of Hartford region.
- External funding sources (Federal, State, philanthropic) for economic development and supportive infrastructure may be limited.
- Pandemic-influenced land use changes such as loss of office and retail space demand may disrupt traditional land use patterns in ways that require significant changes to regain value.

Multimodal Connectivity Analysis

Types of Analysis

The existing conditions analysis looked at the connections that exist between different modes of travel, with a focus on Union Station in Hartford and Bradley International Airport in Windsor Locks. Both of these locations host strong modal interactions – transit, active transportation, passenger vehicles, freight, and air traffic. The analysis also looked at first- and last-mile connections, especially along the CT*rail* Hartford Line.

Key Findings

1. Union Station is well positioned to serve the surrounding businesses, and its integration with CT*transit* bus routes, especially the DASH shuttle, effectively extend its range.

2. There are few bicyclist amenities in the vicinity of Union Station, though the Hartford Bike Master Plan proposes several upgrades which would help promote bus-train-bicycle interconnectivity.

3. The existing Bradley Flyer bus service is mainly used by airport employees. Upgrades such as luggage racks, more frequent service, and an extension to New Britain would make it more convenient for travelers.

4. There are several potential ways to connect the Hartford Line to Bradley International Airport. Rail connectivity could be achieved using either existing or new rail lines, and a new bus connection could also serve employees in Windsor and Windsor Locks.

Table 8: Multimodal Connectivity SWOT Analysis

Strengths	Weaknesses
• Hartford Union Station has strong train-bus connectivity. • A large number of major employers are within walking distance of Union Station. • CT*rail* trains and CT*transit* buses are equipped with bicycle racks.	• There are few bicycle accommodations around Union Station. • There is currently no rail service to Bradley International Airport. • The Bradley Flyer is poorly equipped to serve travelers heading to and from the airport.
Opportunities	**Threats**
• The Hartford Bike Master Plan and micromobility would improve first- and last-mile connectivity around Union Station. • Bradley is less vulnerable to coastal flooding than other airports in the region. • Connected and autonomous vehicle technology opens new avenues to provide mass transit.	• Transit reluctance may remain high throughout or after the COVID-19 pandemic. • Air travel is faced with heavy fluctuations in ridership.

Next Steps

The Existing Conditions analysis, in combination with feedback from the stakeholder engagement program, will be used to identify needs and deficiencies and establish the basis for identifying a universe of alternatives that will be screened to determine how well they align with the project's vision and goals to address the identified needs.